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(दूसरा पुनरीक्षण)

Glossary of Terms Relating to Air Pollution

(Second Revision)

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FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Air Quality Sectional Committee had been approved by the Chemical Division Council.

Air pollution control, today, is a precondition of high priority for the improvement of the quality of life in highly industrialized countries as well as in developing countries. Pollution control in this context depends, among others, on the advances in the related technology.

Standards may define what we may or may not put into the air based on the best available scientific knowledge. They may place limits on the pollutants that can be tolerated without endangering the health and welfare of human beings and of the ecological systems in which we live. In order to avoid misunderstanding in the interpretation of scientific knowledge and data and to facilitate interaction between different sets of people, it becomes necessary to define terms typical to air pollution technology.

This standard was originally published in 1966. The first revision was carried out in 1980. Due to advances in technology and instruments for detection of air pollution, it has become necessary to review and update the existing glossary of terms. Consequently, this revision has been prepared incorporating few additional terms and deleting some terms depending on their usage and meaning in the present context.

Should any difference exist between the definitions in this standard and those in the individual standards, the latter shall prevail.

This standard is intended chiefly to cover the technical definitions of terms, and it may not necessarily include all the legal interpretations of terms.

The composition of the Committee responsible for the formulation of this standard is given at Annex A.

Indian Standard

GLOSSARY OF TERMS RELATING TO AIR POLLUTION

(Second Revision)

1 SCOPE

This standard defines the terms relating to air pollution.

2 TERMINOLOGY

A

Abatement — Reduction or lessening (of pollution) or doing away with (a nuisance).

Absorption

a) The taking up usually of a liquid or gas into the body of another material (the absorbent). Thus, an air pollutant may be removed by absorption in a suitable absorbent.

b) The taking up of radiation by a material it encounters or passes through. This can be the basis of measuring a number of substances.

Absorption Spectroscopy (AS) — Absorption spectroscopy, refers to spectroscopic techniques that measure the absorption of radiation, as a function of frequency or wavelength, due to its interaction with a sample. The sample absorbs energy, i.e., photons, from the radiating field. The intensity of the absorption varies as a function of frequency, and this variation is the absorption spectrum. Absorption spectroscopy is performed across the electromagnetic spectrum. Absorption spectroscopy is employed as an analytical chemistry tool to determine the presence of a particular substance in a sample and, in many cases, to quantify the amount of the substance present. Infrared and ultraviolet-visible spectroscopy are particularly common in analytical application.

Accretion — A phenomenon consisting of the increase in size of particles by the process of external additions; for example, water to salt particles.

Accuracy— Closeness of agreement between the true value and the mean result which would be obtained by applying the experimental procedure a large number of times (*see also* Error).

Acid Rain — Acid rain is a term used to refer to rainfall where the rain water turns acidic. Acid Rain has been reported from areas having high atmospheric concentration of acidic gases such as oxides of Sulphur and oxides of Nitrogen.

NOTE — When *p*H of rainwater is 5.6 or less, it can be considered as acid rain.

Actinograph — An instrument for recording the incoming solar radiation (*see also* Actinometer).

Actinometer — An instrument to measure the incoming solar radiation (*see also* Actinograph).

Active Sampling — This involves the collection of samples, by physical or chemical means, for subsequent laboratory analysis. Typically, a known volume of air is pumped through a filter or chemical collector for a known period of time - the collector then subjected to laboratory analysis.

Acute — Used in relation to the effects of certain concentrations of air pollutants to describe a response coming rapidly to a climax.

Adiabat, Dry —A line on a thermodynamic diagram (for example Tephigram) depicting the variation of the temperature of a parcel of dry air asitspressure changes. Since in atmosphere pressure decreases with height, often in lower atmosphere a dry adiabat is taken to be a line on a height-temperature graph such that the slope is 0.98°C/100 m.

Adsorbable Organohalides (AOx) — Adsorbable Organohalides (AOx) is an organic sum parameter comprising such organics that contain chlorine, bromine or iodine atoms and are adsorbable to activated carbon.

Adsorption — Adsorption is the adhesion of atoms, ions, or molecules from a gas, liquid, or dissolved solid to the surface of a material (the adsorbent). Several air pollutants are known to adsorb quite well to activated charcoal and certain molecular sieves.

Advection — The process of transfer of an atmospheric property (for example, heat, moisture, pollution) by horizontal motion of the air.

Aerodynamic Diameter — Aerodynamic Diameter is a term used to specify the size of an irregular shaped particle of unknown composition / density. Aerodynamic diameter (d_{ae}) is defined as the diameter of a sphere of unit density (density = 1 g/cm^3) that has the same settling velocity in the atmosphere as the particle in consideration.

Aerosol —Finely divided solid or liquid particles of microscopic size suspended and dispersed in a gas or in atmosphere as in the case of mist, fog, haze or smoke. The term is applied to the system of dispersed phase and dispersing medium together, while particles alone are called “aerosol articles”.

After burner — A device fitted after the main point of fuel combustion in a stationary plant or a vehicle to produce more nearly complete combustion of the exhaust gases. It may be a burner fitted to incinerate polluted process gas.

Agglomeration — The clustering or adhering together of a number of small particles to form a body or structure (an agglomerate) which then acts as a larger single particle.

Agglomeration, Sonic — Agglomeration caused by sound waves.

Aggregate

a) Similar to agglomerate, but having weaker bonding.
b) Sand and rubble used to make concrete.

Air Pollution — *See* Pollution.

Air Pollution Control — *See* Control, Air Pollution.

Air, Primary — The air supplied to the fuel in its early stages of combustion.

Air Quality — The term usually refers to the concentration in air of one or more pollutants. For many pollutants the air quality is expressed as a concentration over a certain period of time, for example, µg/m^{3}over24 hours.

Air, Secondary — Air introduced above or beyond the bed of burning fuel to promote complete combustion of volatile material produced in the first stage of combustion.

Air, Standard — *See* S.T.P.

Aitken Nuclei — Particles ranging in size from 0.005 µm to 0.1 µm with or without electrical charge.

Albedo — The ratio of the amount of electromagnetic radiation reflected by a body or a surface to the amount incident upon it (*see also* Reflectance).

Allergy — The abnormal reaction of a living body to physical, chemical or biological agents to which certain body cells are supersensitive. The final effect may be redness, itching, inflammation, tissue damage or other forms of morbidity. These effects, depending on the nature of the material and root cause of exposure, may be localized over a part of body or widespread.

Ambient — Surrounding. It is used to describe physical properties of air (temperature, humidity, pressure, etc) or air pollution concentration in the open air, as against, at the point of emission or indoors, for example, ambient temperature, ambient air quality.

Amenity — In air pollution this means pleasantness and it usually refers to the general quality of the environment distinct from hazards of air pollution can cause physical damage.

Analysis, Instantaneous — It refers to a pollution measuring system in which the analysis is so quick that the results represent the current situation as in the case of optical techniques.

Anemometer — An instrument for measuring wind/air speed.

Anoxia — Deficiency of oxygen in the blood or thereby in body tissues.

Anthracite — A high calorific value coal yielding little ash and volatiles— hence low smoke production. It is slow burning and not normally used on open fires. It is cleaner to handle than most other coals.

Antibody — A substance, protein in nature, synthesized and released in to the body's system specifically in response to invasion by an antigen.

Anticyclone — The condition of atmospheric pressure distribution in which pressure increases towards the centre. This is usually associated with fine, calm weather and with fog in winter.

Antigens — Foreign substances of different chemical types which when introduced into the body, cause the production of specific antibodies capable of reacting with them.

Antiknock Additives — Compounds added to petrol to allow its use in higher compression ratio engines than otherwise permissible and with greater thermal efficiency without the phenomenon of 'knock'. The additives are generally organic lead compounds.

AQI — Air Quality Index is a color- coded index for reporting air quality information and forecast to the public.

Area Source — An area sources of air pollution are air pollutant emission sources which operate within a certain locale. Locomotives operating on certain linear tracks are examples of a line source, whereas locomotives operating within a rail yard are an example of an area source of pollution. Other area sources of air pollution are: multiple flue gas stacks within a single industrial plant, open burning and forest fires and evaporation losses from large spills of volatile liquids etc.

Aromatics — Hydrocarbon compounds containing, as part of their structure, rings of atoms like those found in benzene and other similar cyclic molecules and generally having strong aroma.

In petroleum products, this term distinguishes these hydrocarbons from those which are chainlike in structure (paraffins). Aromatics tend to have higher octane ratings.

Arrester — A device used to affect arrestment.

Arrestment — Arrestment of a pollutant from a gas stream is the process of its trapping or removal by an arrester or cleaning device.

Aspiration — Passing fluid through a medium or over an object by suction. Thus, air is aspirated through a filter medium or over a thermometer (*see also* Aspirator).

Aspirator — Any apparatus, such as a squeeze bulb, fan, pump or venturi, that produces movement of a fluid by suction.

Atmosphere

a) The atmosphere is the envelope of air surrounding the earth.
b) An atmosphere may refer to a much more local volume of air without implying the quality of that air.
c) The term is also often used as a unit of pressure (1 atmosphere pressure equivalent to 760 mm of mercury or 1013.18 millibars).

Atmosphere, Neutral — A neutral atmosphere is one in which lapse rate is dry adiabatic, that is, there is no change in potential temperature with height (see *also* Lapse Rate, Dry, Adiabatic).

Atmosphere, Stable — State of the atmosphere in which vertical air movements are restricted. This happens when there is temperature inversion.

Atmosphere, Unstable — An unstable atmosphere is one in which vertical movements tend to grow thereby substantially increasing turbulence and aiding the dispersion of pollution. Atmosphere is unstable when lapse rate is higher than adiabatic lapse rate (see *also* Lapse Rate, Super Adiabatic).

Atmospheric Dispersion — *See Dispersion*.

Atomic Absorption Spectroscopy (AAS) — Atomic absorption spectroscopy (AAS), is a spectroanalytical procedure for the quantitative determination of chemical elements using the absorption of optical radiation (light) by free atoms in the gaseous state. It requires standards with known analyte content to establish the relation between the measured absorbance and the analyte concentration and relies therefore on the Beer-Lambert Law. In short, the electrons of the atoms in the atomizer can be promoted to higher orbitals (excited state) for a short period of time (nanoseconds) by absorbing a defined quantity of energy (radiation of a given wavelength). This amount of energy, i.e., wavelength, is specific to a particular electron transition in a particular element. In general, each wavelength corresponds to only one element. In analytical chemistry the technique is used for determining the concentration of a particular element (the analyte) in a sample to be analyzed. AAS can be used to determine over 70 different elements.

Atomization—The process by which a solid or liquid is reduced, not to atoms but, to very small particles or droplets as in a fine spray. Good atomization of fuel oil allowing increased fuel/air mixing is necessary to obtain satisfactory combustion. Atomized pollutants may persist remaining suspended in air because of their small particle size.

Automatic Sampling — This is the most sophisticated method producing high-resolution measurements of a range of pollutants at a single point. The sample is measured on-line and in real-time, typically with 15-minute averages or better, with data being collected from individual monitoring sites by telemetry. Instruments using physical scientific measurement techniques, such as chemiluminescence, UV fluorescence, IR absorption and Differential Optical Absorption Spectroscopy (DOAS), are used.

Autometer, Thomas — A device for continuous recording of sulphur dioxide based on the electrolytic conductivity of water through which air passes.

Average, Moving — In a consecutive data set, of n elements, a moving average of r elements is taken as follows: first take the average of elements numbering 1 to r. Next take the average of elements numbering 2 to $r + 1$and so on giving running averages consisting of (n - r + 1) elements.

B

Background — The levels of pollution (in terms of concentration) present already in the atmosphere exclusive of that due to the pollution source under consideration. In general, the term is used to imply the level of any entity present exclusive of the specified source for example, back ground noise, background illumination.

Sometimes the term is used to mean the concentration of the substance some distance from the particular source and therefore largely uninfluenced by it.

Baghouse/Bag Filter — Fabric filter used for dust removal usually made into bag of tubular or envelope shape. The entire structure housing the bags is called a bag house.

Balloon, Pilot — Balloon filled with a light gas (for example hydrogen or helium) released to determine the wind at various heights in the atmosphere. The balloon is tracked by theodolites and successive locations of the balloon are computed, from which winds can be estimated. This is done on routine basis at several stations by national weather services. Radar is also used for this purpose.

BAM (Beta Attenuation Mass Monitor) — The BAM (Beta Attenuation Mass Monitor) measures particulate concentrations automatically. The mass density is measured using the technique of Beta attenuation. A small Beta source is coupled to a sensitive detector which counts the Beta particles. An airstream is passed through a filter and as the mass of particles increases the Beta count is reduced. The relationship between the decrease in count and the particulate mass is computed according to a known equation (the Beer-Lambert law). The amount by which the flow of beta radiation is attenuated by a solid matter is exponentially dependent on its mass and not on any other feature (such as density, chemical composition or some optical or electrical properties) of this matter.

Beaufort Scale — A scale for estimating and reporting wind force ranging from zero for calm to 12 for a hurricane. The latter corresponds to a wind speed range of 133 to 147 km/h. Wind speeds above this and up to218 km/h are also classed under hurricane having Beaufort scale up to17 depending upon wind speed.

Black Carbon — Black Carbon or BC is a component of fine particulate matter (PM ≤ 2.5 µm in aerodynamic diameter). Black Carbon consists of pure carbon in several linked forms. It is formed through the incomplete combustion of fossil fuels, bio fuel, and biomass, and is emitted in both anthropogenic and naturally occurring soot.

Black Smoke — Black Smoke consists of fine particulate matter. These particles can be hazardous to health especially in combination with other pollutants which can adhere to the particulate surfaces. Black smoke is emitted mainly from fuel combustion. Following the large reductions in domestic coal use, the main source is diesel-engine vehicles. Black smoke is measured by its blackening effect on filters. It has been measured for many years in the UK. Now interest is moving to the mass of small particles regardless of this blackening effect.

Blank Determination — *See* Determination, blank.

Bluff Body — An obstacle in the path of fluid flow, because of which the flow gets modified, causing, under certain conditions turbulence in the wake, for example on the leeward side.

Boundary Layer — Where a fluid flows past a physical boundary, the boundary layer is that part of the fluid extending from the boundary into the bulk of the fluid in which the motion of the fluid is significantly affected by the frictional drag at the boundary.

The earth's atmospheric boundary layer is typically the lowest 1000 m or so of the atmosphere. This is also called planetary boundary layer or friction layer.

Breathing Zone — That location in the atmosphere at which persons breathe. Generally, a layer 0 - 1.5 m above ground level is considered as breathing zone.

Breeze, Sea — A local wind blowing on shore when (and because) the land surface is warmer than the sea surface, for example, on a sunny day. The situation may be reversed at night, producing an off-shore land breeze.

Bronchitis — Basically, bronchitis is inflammation of bronchi, the two branches of the air pipe leading to the lungs. It is a reaction of the mucosal lining to an irritant. The word is less exactly, but more widely used to describe a variety of lung disablements which can be associated with air pollution and smoking.

BTEX — BTEX is an acronym that stands for benzene, toluene, ethylbenzene, and xylenes. These compounds are some of the volatile organic compounds (VOCs) found in petroleum derivatives such as petrol (gasoline).

Bubbler — An apparatus charged with water or a reagent selected to absorb specific pollutants when a sample of air is made to bubble through it (*see also* Impinger).

Buffer Capacity — The capacity of certain solutions to oppose a change in properties, for example, acidity when acid or alkali is added.

Buoyancy — The tendency of material immersed in a fluid to float up. In air pollution it is frequently applied to the tendency or otherwise of the hot gas emitted from a chimney to rise in view of their lower density relative to that of the surrounding air. In the atmosphere it implies the upward force experienced by parcels of air which are heated and less dense as compared with the surrounding air.

C

Calm — The air is described as calm in meteorological terms if the wind speed is less than 1 knot. (1 knot = 1.8 km/h = 0.5 m/s approximately).

Sometimes the term is also used when the wind speed is below the measurement threshold of the anemometer.

Calorific Value — A measure of the heating quality of the fuel usually expressed as available heat units from complete combustion of a unit mass of fuel. For example, kJ/kg for solid or liquid fuels and kJ/m^{3}for gaseous fuels. There are gross and net calorific values for hydrogen containing fuels depending respectively on whether the heat of condensation of water produced is included or excluded.

Cancer — A malignant growth, a tumour.

Carbon — Carbon (C) is the building block of life. It is the basic element in all living things, including 50% of the dry weight in the human body. In the form of carbon dioxide, carbon is a powerful greenhouse gas. However, the term 'carbon' used in discussing climate change does not just to refer to carbon dioxide. It includes the other powerful greenhouse gases, such as methane and nitrous oxide. Scientists are able to lump these six gases together under the name 'carbon' by figuring out their carbon dioxide equivalent. So when we talk about 'carbon footprint' and 'carbon neutral,' for example, we are referring to all the major greenhouse gases, not just carbon dioxide.

Carburation — The mixing of air with a volatile fuel to provide a combustible mixture for use in the internal combustion engine. The device in which this occurs is the carburettor.

Carcinogen (Carcinogenic Substance) — A carcinogen is any substance, chemical, radionuclide, or radiation that is an agent directly involved in causing cancer. This may be due to the ability to damage the genome or to the disruption of cellular metabolic processes. Common examples of non-radioactive carcinogens are inhaled asbestos, certain dioxins, benzo[a]pyrene and benzene.

Carcinoma — Malignant tumor of epithelium, regardless of its derivation.

Cascade Impactor — *See* Impactor.

Catalyst — A substance which, though not itself permanently changed, alters the rate of (usually speeds up) a chemical reaction.

Centrifugal — The tendency of outward movement of an object travelling in a curved path, for example if one whirls a ball on a string, the ball tries to move away from the centre and causes tension on the string which is related to the centrifugal force on the ball.

Channelling Effect — Change of normal flow of air when it passes through peculiar constructed topographic features such as valleys or streets and lawns flanked by buildings. Often channelling leads to increase in local wind velocity. Channelling is sometimes also called canyon effect.

Channelling in Packed Columns/Fluidized Beds — This refers to the localized flow pattern of a fluid (liquid or gas) in packed columns or fluidized beds.

Chimney (Stack) Height, Effective — The effective height of a chimney is the sum of its actual physical height and the plume rise. The latter is the rise of the effluent due to buoyancy and efflux velocity.

Chronic — Referring to injurious effects of air pollution, particularly effects on health. It implies lasting or long term morbid effects as against acute effects.

Classification — Separation of items into types. In relation to particles, it implies the process of separating them into fractions on defined size range.

Clinker — Aggregated or sintered ash formed when the ash is heated strongly in a furnace.

Coal Equivalent — A method of describing combustion energy of a given mass of fuel in terms of the mass of a standard coal which would produce an equal amount of heat energy.

Co-carcinogen - Co-carcinogens are chemicals that do not necessarily cause cancer on their own, but promote the activity of other carcinogens in causing cancer.

COH — Coefficient of haze. This is a unit for measuring smoke stains which depends on the reduction of light transmission through the filter after it has collected the smoke sample. Its object is to measure haze over a distance of about 300 m.

Coke — A smokeless solid fuel of low volatile content, traditionally formed from coal by destructive distillation.

Coke, Gas — Solid fuel produced by the carbonization of bituminous coal in a closed chamber known as retort.

Collection Efficiency (of a Device) — Ratio of the quantity of a substance retained by a device to that passed through it. In any air pollution control equipment, if M_1 is the mass of incoming dust, M_e the mass of collected dust and M_0 the mass of outgoing dust, then collection efficiency is:

$$\frac{M_e}{M_1} = \frac{M_1 - M_0}{M_1} = 1 - \frac{M_0}{M_1}$$

Collector — A device for removing and retaining contaminants from air or other gases. Usually, this term is applied to cleaning devices in exhaust systems.

Collector, Dust Fall, Adhesive Type — A device with an adhesive surface for collecting particulate contaminants settling out of the atmosphere.

Combustion — The chemical combination of oxygen with fuel (combustible matter) with rapid heat evolution so that the temperature rises.

The products of combustion are the oxidation products of the components of the fuel. Thus, hydrocarbons produce carbon monoxide, carbon dioxide and hydrogen oxide (water). Combustion of the sulphur in fuels produces sulphur dioxide.

Combustion, Catalytic — Combustion in the presence of a catalyst, to increase the rate of combustion, or affect combustion at a lower temperature.

Concentration, Ground Level — The concentration (amount per unit volume) of a pollutant in air near ground. For physiological purposes this may refer to between 1 and 2 m above the ground, that is, at breathing level. For computation, however, zero height is considered. In most practical cases, there is no difference between the two.

Concentration, Mass — The amount of a substance in unit volume of the medium, for example air, flue gas. Generally ambient air concentrations are expressed, in mg/m^{3}or μg/m^3. In case of stack emissions, normal m^3 is used instead of m^3.

Concentration, Odour —The number of volume units which a unit volume of sample will occupy when diluted to the odour threshold.

Concentration, Particle — Concentration expressed in terms of number of particles per unit volume of the medium, for example, air, flue gas. Also called ‘number concentration’.

Concentration, Time Integrated (TIC) — The concentration at a point integrated with respect to time over a given period. If concentration is plotted against time, TIC is the area under this curve. It has units of µgs/m^3 (or Ci s/m^3 for radioactive pollutants). TIC divided by the time period over which integration is done is therefore equal to average concentration over that period (*see also* Dose and Exposure).

Concentration, Volume — *See* ppm.

Condensate — Liquid or solid matter formed by condensation from the vapour phase. In sampling, this term is applied to those components of an atmosphere which have been isolated by simple cooling.

Confidence Level — The value of the probability of a given interval containing the true value.

Coning — A type of plume behaviour in which both vertical and lateral diffusion occurs. The plume appears like a cone. This takes place in an ear neutral atmosphere when the wind velocity is moderately high or high.

Contaminant/Contamination — Synonyms for indicating the presence of a foreign component or pollutant in air, gas, liquid or on surfaces.

Control, Air Pollution — The process of effecting reduction in the concentrations and extent of contaminants in atmosphere within permissible limits, by whatever means, such that they do not become injurious to human, plant or animal life, or property.

Convection — The transfer of heat in a fluid by flow of parts of the fluid at different temperatures. Convection currents can be set up in air with the rise of hotter, less dense parts and downward flow of cooler, more dense parts (*see also* Buoyancy).

Correlation — A mathematical term which deals with the relationship between two factors or variables. The degree or intensity of linear relationship is measured by correlation coefficient which lies between -1 and +1. A value of zero indicates absence of correlation.

Cracking — The refinery process of chemically breaking up the heavier petroleum distillates to obtain greater quantities of lighter products.

Criteria (Air Quality) — Information used as guidelines for establishing air quality standards or goals, often in the form of dose–response relationships.

Criteria Pollutants — Also known as ‘Six Common Pollutants’ which are known to threaten human health and welfare. Criteria pollutants include ‘ozone, carbon monoxide, nitrogen dioxide, particulate matter, sulfur dioxide, and lead.’ There are threshold concentrations called National Ambient Air Quality Standards (NAAQS) established for each of them.

Cupola — A firebrick-lined shaft furnace used for melting metals, often pigiron (with or without scrap) for castings. Metal, coke and flux (if used) are charged at the top and air is blown in near the bottom. Its operation involves the emission of iron oxide fume which has to be arrested.

Cyclone

a) A mechanical device for the removal of particles from gas streams by centrifugal force imparted by a whirling motion of the gas inside the device.

b) A natural wind system rotating around a centre of low atmospheric pressure. A cyclonic system (in contrast to anticyclonic system) has a low-pressure centre around which strong winds flow anticlockwise in northern hemisphere and clockwise in southern hemisphere.

D

D50 — D represents the diameter of powder particles, and D50 means a cumulative 50 percent point of diameter (or 50 percent pass particle size). Particle size distribution D50 is also known as the median diameter or median value of the particle size distribution, it is the value of the particle size at 50 percent in the cumulative distribution. D50 is usually used to represent the particle size of group of particles.

Decay — In air pollution, the decay of an airborne pollutant usually implies the rate at which it is lost from the atmosphere, for example, by absorption or precipitation, including its loss by transformation into some other chemical. For radioactive pollutants it implies reduction by radioactive transformation.

Degree Day — The condition of a mean of one-degree difference in temperature between the outside temperature and a given base temperature over one day of 24 hours is termed ‘one-degree day’. The heating requirements (fuel consumption) of a building over a period are often taken to be proportional to the number of degree days, that is, the sum of the degree day values for the days of the period.

Deposit Gauge — An instrument designed to assess the rate of deposition of material from the air. In most instances, the gauge receives material through a horizontal opening and the results can be expressed in terms of amount deposited on a given area in a given time.

Deposition velocity — A parameter describing the rate at which a pollutant from air deposits on a surface. It is the ratio of the rate of deposition per unit area of the surface to the concentration near the surface. Though having the dimensions of velocity, it is only a parameter and not a real velocity.

Desorption — The removal of absorbed or adsorbed material.

Desulphurisation — Literally the removal of sulphur. To reduce sulphur dioxide emissions it is possible to use ‘fuel desulphurisation’ so as to reduce the sulphur present in the fuel when it is burnt or ‘flue gas desulphurisation’ in which the sulphur dioxides removed from the gases formed by combustion.

Determination, Blank — When a sample is analysed for assessment of a given pollutant using some procedure, equipment and material, an identical assessment is also made using only the collecting medium for example, a filter paper or a bubbler reagent through which air is passed, not containing the material to be assessed. This latter assessment is called blank determination, sample or run, and is carried out to determine the background contribution due to impurities inherent in the medium, equipment or process.

It is necessary to take this into account in the normal sample analysis.

Dew Point — The temperature to which the sample of air has to be cooled to make it saturated with respect to water at its existing pressure and humidity mixing ratio. It is a measure of moisture content of air. The higher the moisture content, the higher is the dew point.

Diameter, Mass Median — The mass of a sample of particulate matter in terms of the diameter above and below which the masses of all large and smaller particles are equal (*see also* Median).

Differential Optical Absorption Spectroscopy (DOAS) — Differential optical absorption spectroscopy, is used to measure concentrations of trace gases. When combined with basic optical spectrometers such as prisms or diffraction gratings and automated, ground-based observation platforms, what we have is a cheap and powerful means for the measurement of such trace gas species as ozone and nitrogen dioxide.

Diffusion

a) On the scale of molecules, diffusion is a mixing of substances caused by molecular motion (Molecular Diffusion).

b) In atmosphere it implies the spread of pollutants by turbulence or eddy motion (also called Atmospheric Diffusion).

Dispersion — The method by which a pollutant spreads from its point of emission and becomes diluted in the atmosphere. It includes transport by winds and simultaneous spread by turbulence (atmospheric diffusion).

Disposal — Getting rid of, by suitable process and treatment, for example, disposal of the gases to atmosphere and disposal of gaseous wastes after treatment for desulphurisation.

Distance, Exclusion — A distance from or area surrounding a source of pollutant from a given plant entirely under the control of the plant and within which no habitation is permitted.

Distillate — Any product obtained by vapourization from a still or distillation apparatus. The term distillate fuel is often applied to a fraction heavier than petrol or to paraffin (kerosene or gas oil).

Diurnal — An adjective describing the variation of some parameter during a typical day or over 24 hours.

Dose —The amount taken in or received. Time integrated exposure to pollutants, for example, dose of exposure for 1 h to an average sulphur dioxide concentration of 1 000 $\mu g/m^3$. In radiology, it refers to the amount of energy absorbed by a unit mass of body tissue from radiation such as gamma or X-rays (*see also* Exposure and Concentration, Time Integrated).

Down Wash (Down Draught) — A downward movement of smoke or other emissions on the leeward side of stack (chimney) or other obstacles such as buildings, hills, etc, due to aerodynamic characteristics of flow past obstacles (bluff bodies). The downward motion of air itself may be called downdraught whereas downwash applies to the pollutant. Downwash causes reduction in the effective height of emission.

Driving Cycle — In relation to the testing of motor vehicles, particularly to their pollution emission characteristics, they may be made to perform standard driving cycles which are fixed patterns of steady speeds, accelerations and decelerations typical to some particular form of driving, for example, urban use.

Droplet — A small liquid particle of such size and density that it falls under still conditions but may remain suspended under turbulent conditions.

Dust — Small particles in the size range 1 to 200 μm in diameter. Particles above 75 µm size would come into the category of grit. Below about 1μmthe particles, if air borne, would tend to remain in suspension rather than settle due to gravity (see *also* Fume).

Dust Fall — The rate at which dust is deposited from the air on a horizontal surface.

Dust Loading — Mass of dust per normal unit volume in a gas or air stream. When applied to equipment, it is expressed as mass per unit time.

E

Ecology — The relation or interaction of living systems with each other and their environment.

The term is also used to denote the branch of science dealing with the above.

Eddy — A fluctuation from the mean motion of a fluid; also used for parcels of air having circular whirlpool type of motion in the atmosphere. Eddies are the result of turbulent motion of the atmosphere.

Effect, Cumulative — Increasing or building up of the effect with successive or continuing exposures.

Efficiency, Fractional — The emission collection efficiency of a specific size fraction of a contaminant. This term is commonly applied to the performance of air cleaning equipment intended for particulate matter in various sizes and ranges.

Effluent — Literally anything which flows out or is discharged. Usually applied to the discharge of a waste material into a water body or the atmosphere.

Efflux Velocity — The speed with which something is discharged from an orifice, for example gases from the top of a chimney. Also called discharge velocity.

Ejector — A device which uses a fluid under pressure, such as steam, air or water to move another fluid by developing suction. Suction is developed by discharging the fluid under pressure through a venturi.

Electrostatic — A general term describing something having an electrical charge.

Electrostatic Precipitator — A device for removing particles from a gas by making them electrically charged and then making them to adhere to a plate or plates by application of electrostatic field.

Elemental Carbon — Elemental carbon also known as black carbon is formed by the pyrolysis of the organic carbon. A form of carbon, refers to the inorganic form of carbon which can be found in crystalline and amorphous forms.

Elutriation — A process for separating the particles into sized fractions by their different rate of settling down under gravity in a stream of fluid.

Emission — Discharge of effluent into the atmosphere. The term is often used to express an emission rate, for example mass per unit time or an emission concentration, in terms of volume or mass of material per unit volume of total emitted gas.

Emission Factor — An emission factor gives the relationship between the amount of a pollutant produced and the amount of raw material processed or burnt. For example, for mobile sources, the emission factor is given in terms of the relationship between the amount of a pollutant that is produced and the number of vehicle miles travelled. By using the emission factor of a pollutant and specific data regarding quantities of materials used by a given source, it is possible to compute emissions for the source. This approach is used in preparing an emissions inventory.

Emission Standard — The amount of pollutants permitted to be discharged from a pollution source. Emission standards are commonly described in one or more of the following ways:

a) Mass of pollutants over a certain time, for example kg/h or tonnes/day;
b)Mass of pollutants per unit mass of material processed, for example, 2.5 kg per tonne (approximately 0.25 percent); and
c) Volume of pollutants (if gaseous) per unit volume of discharged gas, for example, parts per million.

Emphysema — Pulmonary or lung emphysema is a distension or swelling of the lung air spaces due to destruction of the alveoli which diminishes the area for exchanging oxygen and carbon dioxide between the air and the blood.

Engine, Internal Combustion — An engine in which a fuel/air mixture is burnt within a chamber and the resulting pressure of hot gas is converted to mechanical energy. In contrast, external combustion as in a boiler furnace involves the transmission of energy by a separate agent, for example, steam cycle.

Environment — Literally, surrounding. May apply to the indoor or working conditions but commonly refers to man's total surroundings, natural and manmade. Parts of the environment are often specified. For example biological environment, water environment, air environment, marine environment, etc.

Epidemiology — The scientific study of the frequency and distribution of a disease within a population and often extended to include the relationship of the disease with external factors such as air pollution.

Equivalent Diameter — In relation to airborne particles, it is used to describe the way in which a particle of generally irregular shape behaves as if it were a sphere of a certain diameter (and often of a standard density).

The settling rate equivalent diameter of a dust particle is defined as a diameter of a sphere with unit density which has the same settling rate as the particle in question in air at 20°C and 1.103 bar (760 mm mercury).

Error — The difference between a measured value of an entity and its true value, due to defects in instruments or due to inaccuracy of observation.

Error, Analytical — The deviation of the analytical result from the true com position of the entity analyzed.

Error, Sampling — Part of the total estimation error of a parameter due to the random nature of the sample.

Error, Total Estimation L — In the estimation of a parameter, the difference between the calculated value of the estimator and the true value of this parameter. It may be due to: (a) sampling error, (b) measurement error, (c) rounding off values, (d) bias of estimator, or (e) other errors.

Exhaust — Vent or aperture from which gases are discharged out.

Exposure — A measure or description of the extent to which an object or organism has been subjected or exposed to a particular pollutant (*see also* Dose and Concentration, Time Integrated).

Extrapolation — Estimating the value of something beyond the range in which it has been measured, for example, estimating pollution levels in the near future from a number of values over past years may be called extrapolation of pollution levels in time. Estimation of winds at higher levels from those measured at two or more levels below may be called extrapolation in height.

F

Fanning — A type of plume behaviour under extreme inversion conditions where mostly lateral diffusion takes place with very little vertical mixing.

Fallout — A radioactive pollutant in the air caused after the explosion of a nuclear device; its degree of contamination depending on several factors, such as distance, wind and power of the device.

Sometimes also used to mean, depending upon context, heavy grit, dust and ash depositing near the source (chimney).

Filter

a)In air pollution or analytical chemistry, it means a medium for separating solids from liquid or gas, by passing the liquid or gas through the medium.

b) In optics it means a device which allows rays or radiation of a given wavelength range only to pass through.

c)In spectral analysis of turbulence, it has an analogous meaning signifying a mathematical device which allows only a given frequency of turbulent oscillations to pass through.

Flame Ionisation — Certain gaseous compounds, notably those containing carbon can be estimated by the extent to which they are ionised in a hydrogen flame. The technique is called flame ionisation.

Flame Ionization Detector (FID) — Flame Ionization Detector used in gas chromatography for detection of organic compounds.

Flash Point — The lowest temperature at which a liquid fuel will give off a flammable vapour which will burn momentarily on application of a small flame. There are several methods of measuring the flash point, for example, using an open (Cleveland) or closed cup (Pensky - Martens) apparatus for test.

Flow Meter — An instrument for measuring the rate of flow of a fluid moving through a pipe or duct system. The instrument is calibrated to give volume or mass rate of flow (*see also* Rotameter, Venturi).

Flue Gas — The gaseous product of combustion from a combustion equipment, for example, a boiler furnace or a kiln.

Fluidised Bed — A chemical engineering term to describe a bed of solid particles through which air or any other gas is made to flow upwards in such a fashion as to support the particles and to make them act, in many ways, like a liquid. Furnaces have been devised in which oil or powdered or granulated coal can be introduced into such a (heated) bed where it can burn evenly and produce an even temperature throughout the bed.

Fluorine (F)/Fluorides — In air pollution the term fluorine is often used to cover both the element of that name and its compounds, mostly fluorides. Fluorine and its soluble compounds can be toxic. They are pollutants particularly associated with brick and aluminium production.

Flux — The rate of passage or transfer of a quantity per unit area.

Fly Ash — The finely divided particles of ash readily entrained in flue gases arising from the combustion of fossil fuels (mainly coal). The particles of ash may contain partially burnt fuel.

Fog — Atmospheric obscuration caused by liquid water droplets. In meteorological terms fog implies reduction of visibility to less than 1 km.

Fog, Radiation — With a clear sky and light wind there can be substantial cooling of the air during the evening and night due to earth losing heat by radiation. Where the air temperature falls below the dew point, a fog can be formed. Fog formed by this process is called radiation fog.

Fossil Fuels —A general term covering coal, mineral oil, natural gas, etc., which are fuels derived from organic deposits in ancient geological periods. They consist mainly of carbon and hydrocarbons. By comparison wood and nuclear fuel are not fossil fuels.

Freeze — Out Trap — A device to retain specific pollutants by cooling to low temperatures.

Freons — A range of hydrocarbons with hydrogen replaced partly or totally by fluorine or chlorine. These wholly manmade compounds are used as refrigerants, in fire extinguishers and as aerosol propellants.

Frequency Distribution — A graphical or mathematical method of showing the frequency of occurrence of values of some parameter against the value of that parameter.

Front, Cold — The sharp boundary between two extensive air masses where cold air is replacing warm air.

Front, Warm — The sharp boundary between two extensive air masses where warm air is replacing the cold air.

Fuel, Authorized — A fuel with specified performance characteristics from the point of view of smoke and other pollutants, on the basis of which it may be authorized for use in smoke-controlled areas.

Fume — Very fine solid or liquid particles, 0.001 to 1 µm in diameter, arising from chemical reactions or condensation of vapour (often metal vapour).

The word fumes is commonly used to imply unpleasant and smelling airborne effluents.

Fumigation — When atmospheric conditions are such that there is an unstable layer of atmosphere above ground, topped by a stable inversion layer, the pollutants in the unstable layer often experience a thorough vertical mixing raising the ground level concentration. This is called fumigation. It may occur early in the morning when night time inversion breaks up after sunrise or may exist near the coast when sea breeze brings cold air over the warm air on land.

G

Gas Chromatography — Gas chromatography (GC) is a common type of chromatography used in analytical chemistry for separating and analyzing compounds that can be vaporized without decomposition. Typical uses of GC include testing the purity of a particular substance, or separating the different components of a mixture (the relative amounts of such components can also be determined). In some situations, GC may help in identifying a compound.

Grain — In air pollution this is often encountered as a unit of mass (One grain = 0.064 8 g). This old apothecaries' unit is still used in certain regulations for describing permissible concentrations (1 grain/ft^3 = 2.3 g/m^3) of pollutants in process emissions.

Green House Effect — Retention of heat by the earth and the atmosphere owing to the carbon dioxide in air being 'transparent' to incoming shortwave solar radiation but 'opaque' to long wave radiation back from the earth. This term comes from analogy of green houses where glass and water vapour inside cause shortwave sun's radiation to enter but does not allow long wave radiation to pass out.

Greenhouse Gases (GHGs) — Several important gases in the earth's atmosphere: carbon dioxide, methane, nitrous oxide, ozone, other trace gases and water vapour are known to absorb infrared energy. Surrounding the earth like a giant greenhouse, they maintain the earth's climate. However, in excessive concentrations they contribute to accelerated global climate change/global warming which may adversely affect various aspects of ecosystem. The six greenhouse gases included under the Kyoto Protocol are: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulphur hexafluroide (SF_6), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).

Grit — Particles of solid ranging from 75 to 200 µm in diameter in the air or flue gases which fall out or deposit under their own weight (*see also* Dust).

Ground Level Ozone — Ozone gas present near the surface of the earth is referred to as Ground Level Ozone. It is a secondary pollutant and is produced in the presence of sunlight through a complex reaction involving oxides of nitrogen and several hydrocarbons often called ozone precursors.

Ground Roughness — Natural terrain is not smooth but consists of rocks, grass, trees, buildings, etc., which affect the air flow near the surface of the earth. Thus, forest will be rougher than short grass. A roughness parameter usually denoted by Z_0 is defined such that in neutral atmosphere, the wind U changes with height Z according to the law,

$$U \alpha \log \frac{Z}{Z_0}$$

Guideline, Air Quality — Air quality guideline indicates the level and duration of air pollution by a pollutant above which effects on materials, vegetation or health are produced.

H

Haze — Fine aerosol dispersed through a portion of the atmosphere. The particles are so small that they cannot be felt or individually seen with the naked eye, but they diminish the horizontal visibility and give the atmosphere a characteristic opalascent appearance which subdues all other colours.

Blue haze is found due to the combustion of sulphur or its compounds or some other organic compounds.

High Performance Liquid Chromatography — High-performance liquid chromatography (HPLC), formerly referred to as high-pressure liquid chromatography, is a technique in analytic chemistry used to separate the components in a mixture, to identify each component, and to quantify each component. It relies on pumps to pass a pressurized liquid solvent containing the sample mixture through a column filled with a solid adsorbent material. Each component in the sample interacts slightly differently with the adsorbent material, causing different flow rates for the different components and leading to the separation of the components as they flow out the column.

Histogram — A graphical representation of the frequency distribution of a continuous variable. Classes are represented by continuous intervals on X-axis and absolute (or relative) frequencies of the classes are represented by rectangles on Y-axis, with the areas proportional to the absolute frequencies of the classes.

Homeostasis — The maintenance of internal constancy and independence of the environment within a living substance. Thus, despite changes in ambient temperature, body maintains a nearly constant temperature. Similarly, in spite of deteriorated air quality, the body maintains its functions through proper compensation. There is, however, a limit beyond which the compensation is not possible leading to permanent damage.

Humidity/Relative Humidity — The water vapour content of atmosphere is its humidity. Relative humidity is the ratio (expressed as percentage) of the quantity of water vapour in the atmosphere (per unit volume) to that of the quantity at that temperature if it was saturated with water vapour.

Hydrometer — An instrument for measuring the humidity or relative humidity of the air.

I

Immission — Strictly this means intake by a receptor of pollution. Since this is often related to the concentration of the pollutant in the air there has been a tendency to speak of the immission concentration or even immission as the same as ground level concentration.

Impaction — A forcible contact of particles of matter on any surface. This term is often used synonymously with 'Impingement'. The impacting particles adhere to the surface; a property used in air sampling.

Impactor — A centrifugal separation device often used for collection of particles, having a specific size, of dust entrained in an air stream. An impactor system usually comprises of a jet / nozzle which accelerates the air stream that is directed towards an impaction surface placed a small distance away from the tip of the nozzle. The air stream is thus forced to bend its trajectory leaving behind dust particles on the impaction surface.

Impingement — The act of bringing matter forcibly in contact with any surface. In air sampling, it refers to a process for the collection of particulate matter in which the gas being sampled is directed forcibly against a surface.

Impingement, Dry — The process of impingement so carried out that particulate matter carried in the gas stream is retained upon the surface against which the stream is directed. The collecting surface may be treated with a film of adhesive.

Impingement, Wet — The process of impingement carried out within a body of liquid, the latter serving to retain the particulate matter.

Impinger — A sampling instrument employing impingement for the collection of particulate matter and gases.

Incineration — A waste disposal process by means of which solid, liquid and gaseous combustible wastes are converted, through controlled combustion, to a residue, which contains virtually no combustible matter, and to gases.

Inductively Coupled Plasma — Mass Spectroscopy (ICP-MS) — Inductively coupled plasma mass spectrometry (ICP-MS), is a type of mass spectrometry which is capable of detecting metals and several non-metals at concentrations as low as one part in 1015 (part per quadrillion, ppq) on non-interfered low-background isotopes. This is achieved by ionizing the sample with inductively coupled plasma and then using a mass spectrometer to separate and quantify those ions. Compared to atomic absorption techniques, ICP-MS has greater speed, precision, and sensitivity.

Inductively Coupled Plasma — Optical Emission Spectroscopy (ICP-OES)/(ICP-AES) — Inductively coupled plasma atomic emission spectroscopy (ICP-AES), also referred to as inductively coupled plasma optical emission spectrometry (ICP-OES), is an analytical technique used for the detection of trace metals. It is a type of emission spectroscopy that uses the inductively coupled plasma to produce excited atoms and ions that emit electromagnetic radiation at wavelengths characteristic of a particular element. The intensity of this emission is indicative of the concentration of the element within the sample.

Industry, Chlor Alkali — Industry connected with the manufacture of chlorine, caustic soda and caustic potash and/or related products.

Ingestion — The taking in of a substance to the stomach.

Insolation — Incoming solar radiation falling on a unit horizontal surface (of the earth). This may consist of the radiation directly received from the sun plus that received after scattering by the atmosphere and clouds.

Intensity (Rainfall) — Rate at which rain falls. In practice this is determined by measuring the rainfall over some given time or by measuring time required for a given rainfall. It is important that this time interval should be mentioned.

Intensity (Turbulence) — Square root of the mean square wind speed fluctuation divided by the mean wind speed. The fluctuations may be measured in downwind direction, cross wind direction or in vertical direction separately. Thus, intensity of vertical component of turbulence or horizontal component of turbulence may be defined.

Interference — Effects on the determination of a pollutant, due to the presence of other pollutants or impurities.

Internal Combustion Engine — *see* Engine, Internal Combustion.

Interpolate — To estimate the value of an entity at points between actual measured or known values, for example estimating pollution levels at points between sites at which pollution measurements are actually made. Interpolations can also be done in time, that is, in between two instants.

Inversion — In meteorology an inversion exists when the air temperature increases with height. Under such conditions, vertical movements are damped and vertical spread of the pollutants is attenuated. Inversion may occur in isolated layers also. During inversion, atmosphere is said to be stable.

In Vitro/In Vivo — These two terms differentiate the experimental reproduction of biological processes in isolation from the living organism and biological process occurring within the living organism. The former is called *'in vitro'* and the latter *'in vivo'*.

Isokinetic — Isokinetic sampling implies sampling in such a way that the velocity of the gas entering the sampler is the same as that of the gas being sampled. The sample can thus be expected to have the same particulate content as the gas being sampled.

Isopleth — A line drawn on a map linking places with the same value of some parameter, for example, height, annual rainfall, pollutant concentration.

Isothermal — Literally, at constant temperature. An isothermal layer in the atmosphere is one in which there is no temperature variation with height within the layer. An isothermal process is that in which temperature does not change.

Ionisation Chamber — A device for detecting and measuring radioactivity or nuclear radiation. It consists of a chamber containing a suitable gas and two electrodes having a potential difference high enough to prevent recombination of ion pairs produced when an ionising particle passes through it. Ion pairs are collected by the electrodes and the resulting pulses or current amplified and recorded.

K

Knock — The situation in a spark ignition where part of the air/fuel mixture detonates flame front has reached it. The tendency of a fuel to knock in a petrol engine can be reduced by the blending of suitable compounds in the fuel or by antiknock additives.

L

Labile — A labile material is one which is unstable or reactive.

Lachrymator — A substance which, on contact with eyes, causes irritation and flow of tears.

Lapse Rate — The decrease of an atmospheric variable with height, the variable being temperature unless otherwise specified.

Lapse Rate, Dry, Adiabatic — Rate of decrease of temperature at the rate of0.009 8 °C/m. It is the rate at which parcel of unsaturated air will cool if lifted adiabatically. Also called neutral lapse rate.

Lapse Rate, Super Adiabatic — Atmospheric lapse rate in which the decrease in air temperature with elevation is greater than the normal adiabatic lapse rate. Under this condition, vertical motions are accelerated, and the atmosphere is said to be unstable.

Laser Technique, Raman — A technique in which laser is used as the source of monochromatic light. The scattered beam is scanned for the Raman Lines for a given pollutant which gives the concentration of the pollutant in the path of the beam.

Layer, Mixing, or Layer, Mixed — A layer bounded between two surfaces in which pollutants can disperse and mix well in the vertical direction. Usually, the lower surface is ground and the upper surface may be the lower boundary of a layer having temperature inversion.

Lead Dioxide (Peroxide) Candle — A device in which sulphur dioxide in the air reacts with a film of lead dioxide to produce lead sulphate which is subsequently measured. The device thus gives an indication of sulphur dioxide in the air. Its performance is influenced by condition such as wind and humidity.

Lean Mixture — The air/fuel mixture in an internal combustion engine is described as lean if it contains a low proportion of fuel while a mixture with a high proportion of fuel is described as rich.

Level, Adverse — Referring to level of concentration of a pollutant in the atmosphere at which remedial action is necessary.

Lidar — Laser radar used to study the location and concentration of pollutants, both particulate and gaseous by the reflection or absorption of a laser beam.

Line Source — A line source is a source of air, noise, water contamination or electromagnetic radiation that emanates from a linear (one-dimensional) geometry. The most prominent linear sources are roadway air pollution, aircraft air emissions, traffic noise.

Lofting — A type of plume behaviour characterised by vertical mixing above a specific level, caused by an unstable condition above and a stable (inversion) condition below the level.

Looping — A type of plume which has a wavy character. It occurs in a highly unstable atmosphere because of rapid mixing.

Lung Function — Literally the function of a lung, that is, the transfer of oxygen from the air to the blood and the disposal to the air of carbon dioxide from the blood. More specifically it is a measure of efficiency of lung performance.

M

MAC — Maximum Allowable Concentration. A term similar to the TLV.

Mass Spectrometry — A mass spectrograph in which the charged particle are detected electrically. A vacuum system in which positive rays of various charged atoms are deflected through electric and magnetic fields so as to indicate in order the charge to mass ratio for detection of atomic masses.

Mean, Arithmetic — Sum of the values divided by the number of observations.

Mean, Geometric — The nth root of the product of n values.

Means, Best Practicable — The overall approach of anti—pollution legislation towards industrial emissions which considers available technology and cost of pollutant abatement. A scheduled process should be provided with the best practicable means for abatement of pollution.

Median — The middle most value of a series of observations arranged according to the ascending or descending order of magnitude of a characteristic. In a sample of size n, it is $\left(\frac{n+1}{2}\right)$th value, if n is odd. If n is even, it is the average of $\left(\frac{n}{2}\right)$th and $\left(\frac{n}{2}+1\right)$th values.

Microclimate — The distinctive pattern of meteorological variables within the lowest layers of atmosphere or (sometimes) within a limited area, for example, a town.

Micrometeorology — Study of physical phenomena in the very lowest layers of the atmosphere (of the order of 100 m) or occasionally, over a restricted area, generally of a few kilometres in extent.

Millibar (mb) — A unit of pressure, one thousandth of the basic unit bar. The millibar is equal to 100 Newtons per square metre or 1 000 dynes/cm^2 and approximately 0.75 mm of mercury.

Mist — A suspension or dispersion of liquid droplets in a gas. Usually applied to water droplets in air where visibility has a value of 1 km or more. Natural mists may be aggravated by air pollutants.

Mist Eliminator — A device used for removing mist. It generally consists of wire mesh for mist removal.

Mixing Height — The height in the atmosphere within which emitted pollutants are dispersed and mixed vertically, the vertical mixing being attenuated by presence of inversion layers above that height.

Mixture, Lean — *see* Lean Mixture.

Model, Mathematical — An air pollution mathematical model is a numerical simulation of the emission, dispersion and chemical and other processes controlling ambient pollutant concentrations.

Model, Physical — A physical simulation, like in a wind tunnel, of the emission and dispersion processes controlling ambient pollutant concentrations in a model, used as an aid to understanding the process.

Monitoring — Generally this is used interchangeably with surveillance to mean measuring concentration levels continuously or regularly over a period of time. More specifically it may imply checking that the level of an air pollutant is within prescribed limits. Stack monitoring implies the monitoring of the concentrations in the stack effluents from which total emission rates can be estimated.

Month — For reporting analyses of outdoor air on a monthly rate results are calculated to a base of thirty days, irrespective of the calendar month having 28 to 31 days as defined in Gregarian Calendars.

N

N.T.P — Normal temperature and pressure. Usually refers to a temperature of 0 ºC and pressure of 760 mm Hg.

Necrosis — Localized death of a cell or cells in the living body tissues.

Nephelometer — An instrument for measuring the amount of light scattered or absorbed by a suspension of particles (aerosols). It is used to determine suspended particle concentrations or particle size.

Newton (N) — The SI unit of force; a force required to produce an acceleration of one metre per second when applied to a mass of 1 kg. It is equal to 10^5 dynes or 0.102 kg force.

NOx (Nitrogen Oxides) — Refers to all the oxides of nitrogen, but usually to nitric oxide (NO) and nitrogen dioxide (NO_2) in matters of air pollution. Nitrous oxide (N_2O) the anaesthetic laughing gas is a third reasonably stable oxide of nitrogen.

Nomogram — A form of chart containing scales for the variables (usually 3) involved in a particular formula or calculation. For any values of two of the variables, the corresponding values of the third lie in a straight line with the values of the other two. The basic three variable structure is often extended progressively to cover more variables, taken three at a time, for example, A and B give C, C and D give E.

Nonpoint Source — Pollution that comes from many sources, such as motor vehicles, rather than one source, such as an industrial facility.

Noxious — Harmful.

O

Obscuration — Concealing from sight. In meteorology it relates to restriction of visibility.

Octane Rating — An indicator of the tendency of a motor gasoline to knock in a spark ignition internal combustion engine, higher octane ratings being required for engines of higher compression ratios. The octane number is the percentage by volume of the hydrocarbon iso - octane in a mixture with normal heptane which has the same knocking characteristics as the fuel under test. The higher the octane number, the lower the tendency to knock.

Odour Concentration — *see* Concentration, Odour.

Oil, Gas — A liquid petroleum distillate having a viscosity and distillation range between paraffin (kerosene) and light lubricating oil. It is in the same boiling point range as diesel oil. Often used for heating purposes, it has a relatively low sulphur content.

On-Line

a) A method of measuring a variable in a process continuously and rapidly as the process continues.

b) The arrangement of a computer to process without delay input data obtained from the process, and present output result, say to control a plant, is described as on-line operation.

Opacity Rating — A measurement of the opacity of emissions, defined as the apparent obscuration of an observer's vision to a degree equal to the apparent obscuration of smoke of a given rating on the Ringelmann Chart.

Organoleptic — Affecting an organ. Thus, organoleptic methods of estimating odour depend upon its perception by the human nose.

Orifice Meter — A flow meter, employing as the measure of flow rate the difference between the pressures measured on the upstream and downstream sides of the orifice (that is, the pressure differential across the orifice) in the conveying pipe or duct.

Oven, Coke — Large ovens in which hard caking bituminous coal is subjected to a long process of carbonization at high temperatures.

Oxidants — Material which have an oxidising action on other materials, that is, generally adding oxygen to them chemically or extracting hydrogen.

Typical atmospheric oxidants are ozone and nitrogen dioxide whose action on vegetable material can be damaging.

Ozone Depletion — Thinning (depletion) of the protective 'ozone layer', a fragile band of gases floating in the stratosphere, about 25 km above the earth. This thinning is caused by ozone-depleting chemicals such as chlorofluorocarbons (CFCs), which are released by human activities and products. The ozone layer acts like a giant sunscreen enveloping the earth. It filters out most of the sun's harmful ultraviolet (UV) radiation. Depletion of the ozone layer is allowing more UV rays to reach the earth.

Ozone Depleting Substance (ODS) — Substances responsible for depletion of the ozone layer in the stratosphere. They primarily contain chlorine, fluorine and/or bromine atoms. ODS include carbon tetrachloride, chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs), brominated fluorocarbons (Halons), methyl bromide and methyl chloroform.

These substances are widely used in refrigeration units, insulating foams, as well as cleaning agents, solvents and fire extinguishing agents. Some other substances are being used as transitional substances before their use is phased out because of high global warming potentials.

P

PAN — Peroxyacetylnitrate. This is an eye irritant compound associated with photochemical smog.

Particle — A small discrete mass of solid or liquid matter.

Particle Concentration — *see* Concentration, Particle.

Particle Fall — *see* Dust Fall.

Particulates — Particulate matter in the air usually refers to small solid particles of material found in the atmosphere in addition to gases. Less frequently, it is applied to small liquid aerosol particles.

Passive Sampling — This refers to diffusion tubes or badges that provide a simple and inexpensive indication of average pollution levels over a period of weeks or months. Plastic tubes or discs, open at one end to the atmosphere and with a chemical absorbent at the other, collect a sample for subsequent analysis in the laboratory. The low cost per tube allows sampling at a number of points and is useful in highlighting 'hotspots' where more detailed study may be needed.

Peak, Instantaneous — It refers to a short-term high value, for example of a pollutant concentration.

Percentile — One of the set of numbers on the random variable axis which divides a probability distribution into 100 equal areas. It is a quantity equal to one — hundredth of total population.

Persistent Organic Pollutant (POPs) — Persistent organic pollutants (POPs) are organic compounds that are resistant to environmental degradation through chemical, biological, and photolytic processes. Because of this, they have been observed to persist in the environment, to be capable of long-range transport, bio accumulate in human and animal tissue, bio accumulate in food chains and to have potential significant impacts on human health and the environment. Some examples of POPs are Dioxin, some pesticides.

Several compounds have been identified as hormone disruptors which can alter normal function of endocrine and reproductive systems in humans and wildlife. Cardiovascular disease, cancer, obesity, and diabetes have also been linked to POPs. There are many risks and effects of having these chemicals in our environment. After these pollutants are put into the environment, they are able to stay in the system for decades causing problems such as cancer, birth defects, learning disabilities, immunological, behavioural, neurological and reproductive disorders in humans and animals.

Photochemical Smog — The result of reactions on the atmosphere between nitrogen oxides, organic compounds and oxidants under the influence of sunlight, leading to the formation of oxidizing compounds or possibly causing poor visibility, eye irritation or damage to material and vegetation, if sufficiently concentrated.

Photo Ionization Detector (PID) — Photo Ionization Detector used in gas chromatography for detection of organic compounds.

Phytotoxic — Poisonous to plants.

Plume — The flow or path of effluent from a specific outlet such as a chimney stack or vent. While for smoke, the plume is visible, for many pollutants it may not be so.

PM_1 — PM1 or PM_1 refers to particles in the atmosphere with an aerodynamic diameter of less than or equal to 1 micrometers.

$PM_{2.5}$ — PM2.5 or $PM_{2.5}$ refers to particles in the atmosphere with an aerodynamic diameter of less than or equal to 2.5 micrometers. It may be noted that $PM_{2.5}$ set of particles is a subset of PM_{10}.

PM_5 — PM5 or PM_5 refers to particles in the atmosphere with an aerodynamic diameter of less than or equal to 5 micrometers.

PM_{10} — PM10 or PM_{10} refers to particles in the atmosphere with an aerodynamic diameter of less than or equal to 10 micrometers.

Pneumoconiosis (or Pneumonoconiosis) — A term applied to various diseases of the lung caused by the inhalation of dust particles in such occupations as coal mining, quarrying and asbestos working; an excess of fibrous tissue forms in the lungs round the dust particles.

Pollen — The small grains from the anthers of flowers which contain the male reproductive nuclei. Transported in the air certain of these grains in the air can induce hay fever or asthma in some people by action in the nose. They are thus natural air pollutants.

Pollutant (Primary and Secondary) — A pollutant is something which pollutes the air. A primary air pollutant is one which is put into the air in that form. A secondary pollutant is not emitted as such, but forms in the air from primary pollutants.

Pollution, Air — The presence in ambient atmospheres of substances, generally resulting from the activity of man, in sufficient concentration, present for a sufficient time and under circumstances such as to interfere with comfort, health or welfare of persons or with reasonable use or enjoyment of property.

Polyaromatic Hydrocarbons (PAHs) — Polycyclic aromatic hydrocarbons (PAHs), also poly aromatic hydrocarbons, are hydrocarbons (organic compounds containing only carbon and hydrogen) that are composed of multiple aromatic rings (organic rings in which the electrons are delocalized). PAHs are neutral, non polar molecules. They are found in fossil fuels (oil and coal) and in tar deposits, and are produced, generally, when insufficient oxygen or other factors result in incomplete combustion of organic matter (e.g., in engines and incinerators, when biomass burns in forest fires, etc.).

Polychlorinated Biphenyls (PCBs) — Polychlorinated biphenyl (PCB), is a synthetic organic chemical compound of chlorine attached to biphenyl, which is a molecule composed of two benzene rings. There are 209 configurations of organochlorides with 1 to 10 chlorine atoms. The chemical formula for a PCB is $C_{12}H_{10-x}Cl_x$.

Polychlorinated Dibenzodioxins (PCDDs) — Polychlorinated dibenzodioxins (PCDDs), or simply dioxins, are a group of polyhalogenated organic compounds that are significant environmental pollutants. They are commonly but inaccurately referred to as dioxins for simplicity, because every PCDD molecule contains a dibenzo-1,4-dioxin skeletal structure, with 1,4-dioxin as the central ring. The word “dioxins” may also refer to other similarly acting chlorinated compounds.

Point Source — A stack, vent, duct, pipe or other confined air stream from which chemicals may be released to the air. A point source of pollution is a single identifiable source of air, water, thermal, noise or light pollution. A point source has negligible extent, distinguishing it from other pollution source geometries. The sources are called point sources because in mathematical modeling, they can be approximated as a mathematical point to simplify analysis. Pollution point sources are identical to other physics, engineering, optics, and chemistry point sources and include: Air pollution from an industrial source, rather than an airport or a road, considered a line source or a forest fire which is considered an area source, or volume source.

Ppb (European) — A billion in European usage is a million times a million (10^{12}) so ppb is parts per million million, that is one part in 10^{12}.

ppb (US) — In America a billion is used to mean a thousand million as against a million million in Europe.

Thus 1 ppb (US) = 1 000 ppb (European).

pphm — Parts per hundred million.

ppm — Parts per million. In pollution of the air by a gaseous pollutant, it refers to the number of parts by volume of the gaseous pollutant in one million parts of the total air.

The quantity ppm is related to µg/m³by the relation.

$$\text{Concentration, in } \mu\text{g/m}^3 = 44.64 \times M \left[\frac{273}{273+T}\right]\left[\frac{P_2}{P_1}\right] \text{ ppm}$$

where

M = molecular weight of the pollutant;

T = temperature, in ºC;

P_1 = pressure at NTP; and

P_2 = air pressure.

NOTE — It is recommended that instead of ppb or ppm, µg/m³should be used.

Precipitation

a) The formation of solid particles in a solution.

b) A process of separation of particles from a fluid.

c) In meteorological parlance, moisture falling on the earth’s surface as rain, hail or snow.

Precipitation, Thermal — A process consisting of the separation of particulate matter from air and other gases under the influence of a sufficiently steep thermal gradient. In the thermal precipitator (a sampling instrument),the air or gas is drawn slowly through a narrow chamber across which extends a heated wire, the particulate matter being deposited upon the adjacent collecting surface.

Precipitator, Electrostatic — *see* Electrostatic Precipitator.

Precision — Closeness of agreement (or smallness of variability) among the results obtained by applying the test procedure several times under the prescribed conditions.

Precursor — Something which goes before. Commonly applied to substances in the air which subsequently react or are transformed to produce new air pollutant, for example hydrocarbons are precursors of ozone and other compounds associated with photochemical smog.

Pressure, Critical— The pressure at which a gas may just be liquefied at its critical temperature (see *also* Temperature, Critical).

Pressure, Gauge — The difference between pressure existing within a system and that of the atmosphere. Zero-gauge pressure is equal to atmospheric pressure.

Pressure, Static — The pressure of a fluid at rest or in motion exerted perpendicularly to the direction of flow.

Pressure, Total —The pressure representing the algebraic sum of static pressure and velocity pressure at the point of measurement.

Pressure, Velocity (or Dynamic) — The pressure caused by and related to the velocity of the flow of fluid. It is a measure of the kinetic energy of the fluid.

Probe — A tube used for sampling or for measuring pressures at a distance from the actual collection or measuring apparatus. It is commonly used for reaching inside stacks and ducts.

PUF Sampler — PUF is an acronym for Polyurethane Foam. PUF Sampler refers to a complete air sampling system that traps all airborne organics at flow rates up to 280 l/min in polyurethane foam.

Pulmonary — Related to lungs.

Pump — A device which forces air or other fluids from one place to another. This is usedin forcing air to pass through a sampler such as filter paper or bubbler.

Pyrheliograph — *see* Actinometer.

R

Radiosonde — A balloon borne instrument which transmits data on temperature, pressure and humidity as it rises and moves with the wind.

Rain, Orographic — Rain caused by the raising and cooling of moist air as it passes over mountains.

Rainout — The mechanism whereby small particles in the air are removed by raindrops as they form in the cloud.

Raman Effect — Appearance of additional lines in the spectrum of the light scattered by a substance when illuminated by monochromatic light. The lines are characteristic of the substance and the phenomenon is used to identify and measure its quality.

Ratio, Benefit/Cost — The benefit/cost ratio seeks to compare the benefits of a particular action with its cost. In the case of pollution control expenditure the benefits have to be assessed in terms of the effect of reduced pollution. A benefit/cost ratio of 10:1 implies that for every 1 rupee spent on controlling the pollution, the benefits can be valued at Rs 10.

Recycling — Recovery and reuse of the material generally to make the same sort of products. In some cases reuse for another purpose is included in the term recycling in that it assists material conservation. Exhaust gases from motor vehicles may be recycled in the air input to reduce the overall production of air pollutants.

Reference Method — A reference method or analysis is one against which others are compared. Usually it is a method of high accuracy and precision, and therefore, is not always as simple to perform as a routine method.

Reflectance — The reflectance of a surface is a measure of the extent to which it reflects light or other radiation of specific wavelength. When the radiation is not monochromatic, the term Albedo is used.

Remote Sensing — Detection or measurement of a property of a medium(like atmosphere) such as temperature, concentration of pollutants, etc., from a distance. For example, using radar, rain can be detected or using Laser beam, concentration of pollutants can be measured along the path of the beam by analysing the scattered radiation from the beam. This is in contrast to *in situ* sampling or measurement where the sensor measures the property in the immediate vicinity of the sensor.

Reproducibility — The closeness of agreement among the test results obtained by the same method on identical test material but under different conditions (different operators, different apparatus, different laboratories and/or different times). It is defined as that difference between two such single and independent results as would be exceeded in the long run in only one case in twenty in the normal and correct operation of the test method.

Residence Time — Average time for which any pollutant or particulate matter remains in the atmosphere before settling on earth’s surface. It is equal to the time required for the removal of half the quantity of matter divided by 0.693 or the time required for the contents to reach $1/e$ or 36.8 percent of original value, where e is the base of $\log_e$.

Respirator — A device used by a person for breathing filtered air, or artificial air from a cylinder while working in an area having air contamination.

Response — Reaction or effect of something to a stimulus or influence, for example the effect of a pollutant concentration upon a living organism or responses of an instrument to a given signal.

Response Time — Time taken by an instrument to change the indication from the initial level to $1/e$ times (e = base of natural logarithms = 2.712) the final level on giving a step incremental input.

Retention Factor — Fraction of a contaminant breathed that is retained in the body of the person.

Ringelmann Chart (Scale) — A chart for assessing the darkness of a plume of smoke by visual comparison with a numbered set or grade differing from each other in the width and spacing of black lines printed on a white background. Thus Ringelmann 1 is equivalent to 20 percent black. The percentage of blackness represented by Ringelmann numbers is as follows:

Ringelmann	*Percent of Blackness*
1	20
2	40
3	60
4	80
5	100

‘Dark smoke’ is smoke which is as dark as or darker than Ringelmann 2 and ‘Black smoke’ is as dark as or darker than Ringelmann 4.

Room Temperature — Temperature of a laboratory workplace ranging between 27 ± 5 ºC.

Rotameter — A device, based on the principle of Stoke’s Law for measuring the rate of fluid flow. It consists of a tapered vertical tube having a circular cross — section and containing a float which is free to move in a vertical path to a height dependent upon the rate of fluid flow upward through the tube (see *also* Flow Meter and Orifice Meter).

Run, Blank — *see* Determination, Blank.

Running Average— *see* Average, Moving.

S

Sample, Cumulative — A sample obtained over a period of time, the collected atmosphere being retained in a single vessel, or with a separated component accumulating into a single whole such as dust sampling in which all the dust separated from air is accumulated in one mass of fluid; acid gas is absorbed in an alkaline solution; and air is collected in a plastic bag or gasometer. Such a sample does not reflect variations in concentration during the period of sampling.

Sample, Grab — A sample taken or grabbed at a single point in a short time rather than accumulated over a period. This is representative of only the conditions at the particular time of sampling. This is also known as *Snap sample.*

Sampling — Taking or withdrawing a fraction of a substance usually for study as representative of the whole.

Sampling, Continuous — Sampling without interruptions throughout an operation or for a predetermined time, that is, uninterrupted sampling of air, usually at a fixed rate. Where the sample can be analysed continuously, the stream of gas may be passed through a measuring instrument continuously. Otherwise, the sample is collected in an uninterrupted fashion for a given period and the entire sample is finally analysed to give the mean composition of the air over whole period.

Sampling, Cumulative — A process or system in which the sample is accumulated either by sampling continuously or for finite periods at regular intervals to give a single sample whose composition is regarded as representative of the whole period of its accumulation.

Sampling, *In-situ*— Sampling of a property of a medium (for example atmosphere) by using sensors or detectors at the actual place where sampling is desired (*see also* Remote Sensing).

Sampling, Instantaneous — Obtaining a sample of an atmosphere in a very short period of time, such that this sampling time is insignificant in comparison with the duration of the operation or the period being studied. It implies sampling at one point in time (instantaneous sampling is possible with electrical and optical devices).

Sampling, Intermittent — Sampling successively for limited periods of time throughout an operation or for a predetermined period of time. The durations of sampling periods and of the intervals in between are not necessarily regular and are not specified. In contrast to continuous sampling, intermittent sampling means that sampling occurs at intervals for only a fraction of the total time.

Sampling, Random — Random sampling is a sampling scheme without a predetermined pattern. Proper random sampling involves the express selection of sampling units or times so that there is no bias towards selection of particular units or times and the sample is likely, as far as possible, to be representative of the whole.

Sampling, Running — Withdrawal of a portion of the atmosphere over a period of time with continuous analysis or with separation of the desired material continuously and in a linear form such as withdrawal of the atmosphere accompanied by absorption of a component. In a flowing stream of absorbent or by filtration in a moving strip of paper. Such a sample may be obtained with a considerable concentration of the contaminant but it still indicates fluctuations in concentration which occur during the period of sampling.

Sampling, Source — Sampling of air containing contaminants at the place of origin of the contaminant.

Sampling Devices, Inertial — Devices, such as depository trays, dust fall gauges and collectors, to determine the total amount of material settling in them in a given time.

Sampling Efficiency — *see* **Collection Efficiency**.

Saturation — The point where a substance is charged with the greatest possible amount of another substance or property. In meteorology or air pollution work it is frequently used in respect of air being saturated with moisture in which case air put in contact with a plane surface of water at that temperature will neither gain nor lose water vapour.

Scrubbing/Scrubber — An absorption operation in which gaseous or fine particulate pollutants are removed from a stream of air or gas by contact with a liquid spray or a bath or wetted packing/wet surfaces in a tower. The apparatus/equipment used is known as scrubber.

Sea Breeze — *see* Breeze, Sea.

Secondary Pollutants — Secondary Pollutants are pollutants formed by chemical reactions in the atmosphere, either with other chemicals or with light, for example, Ozone (O_3) and photochemical smog.

Sensitivity

a) In chemical analysis the sensitivity of a method is a measure of the minimum value which can be estimated by the method.

b) It is also used to describe an abnormal reaction of the body to certain substances.

c) Sensitivity of an instrument is used to denote lowest measurable change in a variable that the instrument can measure.

Settling Velocity, Terminal — The maximum velocity reached by a falling particle when the gravitational force on it (its weight) is balanced by the viscous drag of the fluid through which it is falling.

Size Distribution, Particle — A method of expressing the make-up of a population of particles (in any dust, aerosols, etc) in terms of either the mass or number of particles between certain size limits, for example equivalent diameter of 0 to 1 μm, 1 to 5 μm, 5 to 10 μm (*see also* Impactor, Cascade).

Smelter — A place where fusion of an ore or concentrate is carried out with suitable fluxes, to produce a melt consisting of two layers; on top a slag of the flux, and below, molten impure matter.

Smog — The word 'smog' refer to the unique atmospheric condition resulting from a combination of smoke and fog. Smog now refers to the yellow-brown haze that is a mixture of pollutants, mainly ground-level ozone and particulate matter ($PM_{2.5}$). Smog is a mixture of air pollutants, smoke, dust, aerosols, etc. that can degrade air quality and visibility. Smog was traditionally used to refer to ground-level ozone in an urban pollution plume.

Smoke — Smoke is a collection of airborne solid and liquid particulates and gases emitted when a material undergoes combustion or pyrolysis, together with the quantity of air that is entrained or otherwise mixed into the mass. It is commonly an unwanted by-product of fires (including stoves, candles, oil lamps, and fireplaces).

Smoke Scale, Bacharach — A scale of 10 shades from white to black for the assessment of smoke in flue gases. A smoke stain obtained by sampling flue gases through a filter paper in a prescribed manner is graded according to the scale.

Smuts — Small aggregates of soot, unburnt solids or fly ash which may be emitted from chimneys and then be deposited in the vicinity. In certain circumstances, the production of sulphur trioxide during combustion may give rise to acid smuts which are corrosive.

Solarimeter — *see* Actinometer.

Soot — Soot is impure carbon particles resulting from the incomplete combustion of hydrocarbons. It is more properly restricted to the product of the gas-phase combustion process but is commonly extended to include the residual pyrolysed fuel particles such as coal, cenospheres, charred wood, petroleum coke, and so on, that may become airborne during pyrolysis and that are more properly identified as cokes or chars.

Sorbent — A liquid or solid medium in or upon which materials are retained by absorption or adsorption.

Sorption — A process consisting of either absorption or adsorption.

Source (of Pollution) — A point or place from which effluents are discharged into air.

Spectroscopic Method — The method using optical absorption or emission properties of a substance. The light absorbed by or emitted from a substance when made to do so is measured using a spectrometer. The wavelength and quality of light absorbed or emitted is used to detect the substance and measure its quality in a sample.

Spectrometry, NDIR — 'Non-Dispersive Infra-Red' spectrometry. While in conventional spectrometry, a light beam is first dispersed using a prism or grating and a (effectively) monochromatic beam is selected, by changing a suitable angle, in the NDIR spectrometry a beam in infrared region of the spectrum is made monochromatic using an interference filter. Absorption of this beam by a sample gas is measured to determine the quality of gas in the sample.

Spectrophotometry — The measurement of the concentration of a substance in solution by the amount of light emitted or absorbed of a colour(wavelength) characteristic of the substance being measured.

Stable (Compound) — A stable compound is one which is not easily decomposed or does not react readily.

Stack Solids — The solid content of the gas stream going up a stack or chimney.

Stain, Smoke — This term is applied to the darkness of a filter through which air has been sampled. The filter retains smoke particles and the stain can be expressed as a concentration of equivalent standard smoke.

Standard Air — *see* S.T.P.

Standard Deviation — A widely used measure of dispersion of a number of observations of some quantity. It is the square root of the average of the squares of the differences of each observation from the mean of those observations. It is a parameter in the Gaussian distribution and represents the value of the variable measured on either side from the mean with in which 68.45 percent of the probability is covered. It is the square root of the variance.

Standard Level — In respect of air quality it may imply a commonly agreed level above which effects of some type or other are believed to occur. It also represents an air quality or emission level which should not be exceeded at all or for specified periods. It may also refer to the maximum permitted level of air contaminant as established by a legal authority.

Standard Smoke — For certain smokes the relationship has been measured between the darkness of stain produced by sampling on a filter and separate gravimetric measurements of the smoke concentrations. This allows filter stains to be expressed in terms of a concentration of equivalent standard smoke.

STEL — Short Term Exposure Limit is defined as the concentration to which workers can be exposed continuously for a short period of time usually 15 minutes without suffering from irritation or other harmful effects. STEL is a term used in occupational health, industrial hygiene and toxicology.

S.T.P. — Standard Temperature and Pressure for air parameter measurements. It refers to a temperature of 25 ºC and a pressure of 760 mm Hg. When referring to air, a relative humidity of 45 - 65 percent is assumed.

Survey (Surveillance) — An air pollution survey is an examination of the condition of the air usually at a number of points and/or over a length of time. Surveillance, usually from safety consideration, implies surveying over time. Monitoring is often used in the same sense.

Survey, Damage — Assessment of damage caused by the pollutant in a specified area.

Suspended Particulates — Particles which are too fine to have an appreciable falling velocity and therefore tend to stay suspended in atmosphere for a considerable period.

Synergistic — Referring to additive or mutually supporting or aggravating effect of toxic substances on living things.

Synoptic — Affording an overall view. In meteorology a synoptic chart displays the state of atmosphere over a large area at one time. By extension, synoptic is used to refer to features, for example cyclones or anticyclones, which appear in such charts.

T

Tar — A thick dark brown or black viscous liquid obtained by distillation of wood, coal, peat, crude, oil etc.

The distillation need not be in a still. Distillation may occur in a domestic grate and chimney.

Telemetering — The transmission of signals from a measuring instrument by cables or by wireless to a distant point where the results can be displayed or recorded. Telemetering enables the levels of pollution at a number of locations to be displayed at a single point.

Temperature, Critical — The critical temperature of a given gas is the temperature above which it cannot be liquefied.

Temperature, potential — Temperature that a parcel of air in the atmosphere would attain if it is brought adiabatically to a pressure of 1000 mb (*see also* Lapse Rate, Dry, Adiabatic).

TEOM — The tapered element oscillating microbalance (TEOM) is used to continuously measure particulate concentrations. It measures the mass collected on an exchangeable filter cartridge by monitoring the corresponding frequency changes of a tapered element. The sample flow passes through the filter, where particulate matter collects, and then continues through the hollow tapered element on its way to an electronic flow control system and vacuum pump. An electrical circuit places the tube into oscillation, and the resonant frequency of the tube is proportional to the square root of the mass on the filter.

Tephigram — A thermodynamic diagram or chart depicting graphically relations between physical variables of a gas, for example between temperature, pressure, potential temperature of air in the atmosphere with different moisture content.

Thoracic Fraction — Nature has gifted the human respiratory tract with several mechanisms for removing particulates inhaled with the air we breathe. The mass fraction of inhaled particles penetrating beyond the larynx is usually referred as the 'Thoracic Fraction'.

Threshold, Odour — The lowest concentration of an odour bearing gas at which only half of a panel of sniffers can detect its presence.

TLV — Threshold Limit Value. This is the concentration of any of a number of pollutants recommended as a maximum to which healthy adult workers may be exposed 8 hours a day for five continuous days a week without adverse effects.

NOTE —— The list is compiled by the American Conference of Governmental Industrial Hygienists but is used extensively in many countries. Although l/30 or l/40 of the TLV is often used as a rule-of-thumb guide to an acceptable ambient concentration of a pollutant for 'the general public', there are many exceptions and the ACGIH specifically warns against the practice.

Topography — The layout of an area in terms of height, the natural features and/or buildings, etc.

Total Organic Carbon (TOC) — Total organic carbon (TOC) is the amount of carbon bound in an organic compound and is often used as a non-specific indicator of water quality.

Tower, Flare — An outlet, generally elevated, to exhaust inflammable gases after igniting them. Also called 'flare stack', or 'flare'.

Tower, Prilling — A tower in fertilizer industry, where a hot concentrated solution of ammonium nitrate or urea is sprayed and in which it crystallizes as it descends through a rising current of atmospheric air.

Toxic Air Pollutants — Air toxics or toxic air pollutants, also known as hazardous air pollutants, are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects.

Toxicity — A measure of poisonous or damaging effects of a substance on a living organism.

Tracer Technique — A method of studying pollutant behaviour in the air by the injection or release of a specifically identifiable substance. The subsequent distribution of the tracer is taken to be similar to that of the pollutant from the same starting point.

Troposphere — The lowest part of the earth's atmosphere, (about 9 to20 km deep depending upon latitude), in which the temperature generally decreases with height.

Tube, Indicator — A tube containing a substance or reagent which reacts with some specific pollutant to give a visible indication of the quality of the reagent reacted with the pollutant by change in colour or otherwise. When polluted air of known quality is passed through the indicator tube, the concentration can be approximately assessed from the degree of visible indication. Such tubes are often used for grab sampling.

Turbidity

a) The cloudiness of a liquid caused by fine suspended particles. More precisely it describes the reduction of light passing through the liquid (caused by the suspended particles).
b) In meteorology it refers to any condition of the atmosphere which reduces its transparency to light; a measure of reduction of transparency normally excluding cloud.

Turbulence — A motion of the wind or air flow in a highly irregular manner both in speed and direction. It is the main mechanism of diffusion of pollutants in the air (see *also* Eddy).

U

Urban Heat Island — A zone of excess warmth within a city over the suburban and rural environs. The warmer air in this region rises upwards and then spreads radially outwards. The colder air from the surrounding countryside at the surface flows inwards towards the heat island to replace the rising and outspreading warm air. This occurs when the heat islands are intense. This circulation is known as Urban Heat Island Effect.

Uncertainty of Measurement — A parameter associated with the result of measurement that characterizes the dispersion of the values that could reasonably be attributed to the measurand.

Unstable Compound — An unstable chemical compound is one which is easily decomposed or which reacts readily.

V

Vapour — A gas is said to be vapour if, at the temperature concerned, it can be liquefied by pressure alone.

Vapour Pressure — The pressure exerted by a vapour, either alone or mixed with other gases. The saturated vapour pressure of a substance at any temperature is pressure of the vapour of the substance in equilibrium with its liquid form.

Variance — A statistical term. The square of the standard deviation that is, the average of the squares of the deviations of a number of observations of a quantity from their mean value.

Ventilation

a) The process of replacing contaminated or stale air by fresh air.
b) The movement and circulation of outdoor air.
c) The volume of air entering or leaving the lungs in one respiratory cycle.

Ventilation Coefficient — It is defined as a product of mixing height and average wind speed.

Venturi — A tube which is constricted and then opens out again and can be used to meter the flow of gas or to assist the scrubbing of a gas by a liquid.

Visibility — A measure of cleanness of the air expressing how far objects can be clearly seen under specified conditions. Light absorption and scattering by aerosols are the main causes of reduced visibility.

VOC — Volatile organic compounds which readily turn into vapour phase at ambient temperature.

W

Washout — The removal of gases, and sometimes particles, from the atmosphere by their solution or attachment to rain drops as they fall.

Week

a) For in-plant use it is considered to be the number of workdays within a period of seven consecutive days.
b) For reporting analyses of outdoor air on a weekly rate results are calculated to a base of seven consecutive 24-hour days.

Wind Rose — A diagram showing the frequency and strength of winds of various directions over a period in a particular place.

Wind Shear — The change in speed and direction of the wind, usually with height.

Y

Year — For reporting analyses of outdoor air on a yearly rate, twelve 30-daymonths are to be used.

Z

Zone, Exclusion — *see* Distance, Exclusion.

Zoning — A method of abating air pollution at a location by a systematic planning of sites for dwellings and for factories/industries which discharge effluents considering the micrometeorological conditions in and around the location.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Air Quality Sectional Committee, CHD 35

Organization	*Representative(s)*
Bhabha Atomic Research Centre, Mumbai	Dr Gauri Pandit (***Chairman***)
Avantha Centre for Industrial Research and Development, Yamuna Nagar	Dr Nishikant Bhardwaj Dr Sunil Kumar (*Alternate*)
Bharat Heavy Electricals Limited, Haridwar	Dr S. Bhatnagar Shri Ambrish Goel (*Alternate*)
Central Institute of Mining and Fuel Research, Dhanbad	Shri R. C. Tripathi Dr N. K. Srivastava (*Alternate*)
Central Pollution Control Board, New Delhi	Dr S. K. Tyagi
Central Road and Research Institute, New Delhi	Dr Niraj Sharma Dr Rina Singh (*Alternate*)
Confederation of Indian Industry, New Delhi	Smt Reena Arora Shri Dhirendra Singh (*Alternate*)
Delhi Technological University, New Delhi	Dr Rakesh Mehrotra Dr Anubha Mandal (*Alternate*)
Dept of Civil Engineering, Indian Institute of Technology, New Delhi	Dr Aravind Nema
Director General, Factory Advice Service and Labour Institute, Mumbai	Shri M. R. Rajput Smt Dhanashree Achrekar (*Alternate*)
Ecotech Instruments, Greater Noida	Dr Rajendra Prasad
Federation of Indian Chambers of Commerce and Industry, New Delhi	Ms Archana Datta Ms Suchismita Mukhopadhyay (*Alternate*)
Gujarat Pollution Control Board, Gandhinagar	Shri K. C. Mistry Shri B. Y. Rathod (*Alternate*)
Himachal Pradesh State Pollution Control Board, Himachal Pradesh	Dr T. B. Singh Dr Manoj Chauhan (*Alternate*)
In personal capacity (House No. 9, Second Floor Sukhdev Vihar New Delhi 110025)	Shri Rakesh Agarwal
In personal capacity (1221, Mahatma Gandhi Road, P.O. - Haridevpur, Kolkata - 700082)	Shri Sanjib Kumar Goswami
In personal capacity (H.No. 514, SSST Nagar, Rajpura Road, Patiala 147003 Punjab, India)	Dr H. K. Parwana
Indian Centre for Plastics in the Environment, Mumbai	Shri T. K. Bandopadhyay Shri Maninder Singh (*Alternate*)
Indian Chemical Council, Mumbai	Dr N. J. Singh Shri A. A. Panjwani (*Alternate*)
Indian Council for Agriculture Research, New Delhi	Dr Kanchan K. Singh Dr Panna Lal Singh (*Alternate*)
Indian Institute of Toxicology Research, Lucknow	Shri S. C. Barman
Indian Oil Corporation Ltd, Faridabad	Dr M. P. Singh
Jharkhand State Pollution Control Board, Ranchi	Shri R. N. Kashyap

Organization	*Representative(s)*
Maharashtra State Pollution Control Board, Mumbai	Dr A. R. Supate Dr V. R .Thakur (*Alternate*)
National Environmental Engineering Research Institute, Nagpur	Dr S. K. Goyal Dr P. K. Labhsetwar (*Alternate*)
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The Energy and Resource Institute, New Delhi	Col R. K. Johri Dr Sunil Pandey (*Alternate*)
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Member Secretary

Kreeti Das
Scientist 'B', CHD

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Western	: Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400093	2832 9295, 2832 7858 2832 7891, 2832 7892

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